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INVENTOR: Toru KOHDA

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ATTORNEY: Tadashi Horie
(Registration No. 40,437)

BRINKS HOFER GILSON & LIONE
POST OFFICE BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200

PIPE JOINT AND SOCKET FOR PIPE JOINT

FIELD OF THE INVENTION

[0001] The present invention generally relates to pipe couplings comprised of sockets (or female coupling members) and plugs (or male coupling members) and more particularly, to a quick connect pipe coupling wherein coupling engagement is quickly achieved simply by pushing a plug into a socket.

BACKGROUND OF THE INVENTION

[0002] There have been proposed a wide variety of quick connect pipe couplings wherein a socket is provided with locking balls, and a plug has a locking recess. Upon insertion of the plug into the socket, the locking balls are received in the locking recess to prevent disconnection of the plug from the socket.

[0003] One such quick connect pipe coupling includes a socket provided with a plurality of locking elements and formed with a plug receiving bore. A retainer is slidably movable on the inner wall of the bore to prevent the entry of the locking elements into the bore. When a plug is inserted a given distance into the bore, the retainer is axially moved away from the locking elements to allow the locking balls to be received in a locking recess formed on the plug. A sleeve is movably disposed about the socket. When the locking elements are received in the locking recess, the sleeve is moved over the locking elements to lock the locking elements against removal from the locking recess and thus, prevent disconnection of the plug from the socket (see, for example Reference 1).

[0004] Another quick connect pipe coupling teaches the use of an annular member disposed radially outwardly, rather than inwardly, of a plurality of locking elements. The annular member is axially movable on a socket and has a ramp. When a plug is inserted into the socket, the coupling end of the plug radially outwardly urges the locking elements into engagement with the ramp of the annular member. As a result, the annular member is axially moved to allow radial outward movement of the locking elements. The locking elements are thereafter received in a locking recess formed on

the plug so as to provide a connection between the plug and the socket (see, for example, Reference 2).

[0005] In such a quick connect pipe coupling, the sleeve and the socket may be provided with a slot and a pin, respectively so that the sleeve is free to move in an axial direction only when the pin and the slot are axially aligned with one another. This axial movement allows removal of a plug from the socket (see, for example, References 3 and 4).

Reference 1: Japanese utility model publication No. 57-49030

Reference 2: Japanese utility model publication No. 47-42013

Reference 3: Japanese utility model application publication No. 51-69119

Reference 4: Japanese utility model publication No. 3-42305

[0006] In the pipe coupling shown in Reference 2, the annular member is returned to its initial position under the action of a spring after the locking elements are received in the locking recess. With the annular member in its initial position, the ramp of the annular member is engaged with the locking elements to complete connection between the socket and the plug. If an undue pulling force is exerted on the plug, the inclined side wall of the locking recess urges the locking elements in a radially outward direction. This results in axial displacement of the annular member in the same manner as when the plug is inserted into the socket. Under the circumstances, the plug can undesirably be pulled out of the socket.

[0007] It is, therefore, an object of the present invention to provide a pipe coupling and a socket therefore, which can securely lock a plug against removal from a socket if a pulling force is exerted on the plug.

SUMMARY OF THE INVENTION

[0008] According to one aspect of the present invention, there is provided a socket adapted to receive to a mating plug to collectively form a pipe coupling.

[0009] The socket includes a cylindrical socket body having a first through aperture extending radially therethrough, a locking element radially movable within the first through aperture and moved between a first radial position wherein the locking element is engaged with a locking recess on the plug so as to inhibit disconnection of the plug from the socket and a second radial position wherein the locking element is radially

outwardly displaced from the first radial position and disengaged from the locking recess to allow disconnection of the plug from the socket, a sleeve disposed around the socket body and having a locking surface adapted to hold the locking element against radial outward movement and prevent movement of the locking element from the first radial position to the second radial position and an unlocking surface adapted to allow movement of the locking element from the first radial position to the second radial position, the sleeve being axially movable between a locking position wherein the locking surface is positioned radially outwardly of the locking element and an unlocking position wherein the unlocking surface is positioned radially outwardly of the locking element, and a spring for biasing the sleeve toward the locking position.

[0010] The plug includes a coupling end directed toward the socket, and a cylindrical surface extending from the coupling end in a direction away from the socket. The locking recess is defined on the cylindrical surface. The coupling end of the plug is slidably engaged with the locking element located in the first radial position to cause radial outward movement of the locking element when the plug is inserted into the socket.

[0011] The socket body includes a second through aperture located axially closer to the plug than the first through aperture and extending radially therethrough and a sleeve actuator disposed in the second through aperture and movable between a radially inward position wherein the sleeve actuator is engaged with the coupling end of the plug upon insertion of the plug into the socket and a radially outward position wherein the sleeve actuator is located radially outwardly from the radially inward position.

[0012] The sleeve has an inclined surface inclined radially outwardly from the locking surface toward the unlocking surface. The inclined surface is engaged with the sleeve actuator when the sleeve is located in the locking position. Upon insertion of the plug into the socket, the coupling end of the plug is first engaged with the sleeve actuator so that the sleeve actuator is radially outwardly moved to thereby cause axial movement of the sleeve against the bias of the spring. The coupling end of the sleeve then comes into engagement with the locking element during advancement of the plug. At this time, the inclined surface of the sleeve is moved to a radially outward position

relative to the locking element. As the plug is further inserted, the coupling end of the plug radially outwardly urges the locking element against the inclined surface of the sleeve. An axial force is then exerted on the inclined surface of the sleeve through the locking element. This results in further axial movement of the sleeve.

[0013] With this arrangement, the locking element is received in the locking recess upon full insertion of the plug into the socket. In this condition, the locking element is held against the locking surface rather than the inclined surface of the sleeve. As such, the plug can not be pulled out of the socket unless the sleeve is moved to the unlocking position against the action of the spring. This arrangement thus prevents accidental removal of the plug from the socket.

[0014] In one embodiment, the locking recess has a given axial length and includes axially opposite circumferential side walls. The sleeve actuator and the locking element are engaged with the side walls when the spring urges the sleeve in a direction opposite the direction in which the plug is inserted into the socket after the sleeve actuator and the locking element are moved into the locking recess upon insertion of the plug into the socket. This configuration prevents axial wobbling of the plug within the socket.

[0015] According to another aspect of the present invention, there is provided a socket adapted to receive a mating plug to collectively form a pipe coupling.

[0016] The socket includes a cylindrical socket body having a first through aperture extending radially therethrough, a locking element radially movable within the first through aperture and moved between a first radial position wherein the locking element is engaged with a locking recess on the plug so as to inhibit disconnection of the plug from the socket and a second radial position wherein the locking element is radially outwardly displaced from the first radial position and disengaged from the locking recess to allow disconnection of the plug from the socket, a first sleeve disposed around the socket body and having a locking surface adapted to hold the locking element against radial outward movement and prevent movement of the locking element from the first radial position to the second radial position and an unlocking surface adapted to allow movement of the locking element from the first radial position to the second radial position, the first sleeve being axially movable between a locking

position wherein the locking surface is positioned radially outwardly of the locking element and an unlocking position wherein the unlocking surface is positioned radially outwardly of the locking element, and a first spring for biasing the first sleeve toward the locking position.

[0017] The plug includes a coupling end directed toward the socket, and a cylindrical surface extending from the coupling end in a direction away from the socket. The locking recess is defined on the cylindrical surface. The coupling end of the plug is slidably engaged with the locking element located in the first radial position to cause radial outward movement of the locking element when the plug is inserted into the socket.

[0018] The socket body includes a second through aperture located axially closer to the plug than the first through aperture and extending radially therethrough and a sleeve actuator disposed in the second through aperture and movable between a radially inward position wherein the sleeve actuator is engaged with the coupling end of the plug upon insertion of the plug into the socket and a radially outward position wherein the sleeve actuator is located radially outwardly from the radially inward position.

[0019] The first sleeve has an inclined surface inclined radially outwardly from the locking surface toward the unlocking surface. The inclined surface is engaged with the sleeve actuator when the first sleeve is located in the locking position. The coupling end of the plug is first engaged with the sleeve actuator upon insertion of the plug into the socket so that the sleeve actuator is radially outwardly moved to thereby cause axial movement of the first sleeve against the bias of the spring. The coupling end of the sleeve then comes into engagement with the locking element during advancement of the plug. At this time, the inclined surface of the sleeve is moved to a radially outward position relative to the locking element. As the plug is further inserted, the coupling end of the plug radially outwardly urges the locking element against the inclined surface of the sleeve. An axial force is then exerted on the inclined surface of the sleeve through the locking element. This results in further axial movement of the sleeve.

[0020] The socket further includes a second sleeve disposed around the first sleeve and movable between a first axial position and a second axial position, allowing axial movement of the first sleeve upon insertion of the plug when the second sleeve is placed in the first axial position, allowing the first sleeve to be moved from the locking position to the unlocking position against the bias of the first spring when the second sleeve is moved from the first axial position to the second axial position, and rotatably moved on the socket between a first angular position and a second angular position, and a stopper arranged on the socket and engaged with the second sleeve to prevent axial movement of the second sleeve when the second sleeve is placed in the first angular position.

[0021] The second sleeve has a stopper receiving portion configured to prevent engagement of the stopper with the second sleeve and allow axial movement of the second sleeve when the sleeve is placed in the second angular position.

[0022] This socket is similar in operation to the socket as previously mentioned and thus offers the same advantageous effect. Also, the socket locks the plug from removal unless the second sleeve is moved to the second angular position.

[0023] In one embodiment, a second spring is provided to urge the second sleeve toward the first angular position.

[0024] More specifically, a coil spring is disposed around the socket body. The coil spring has one end located at a given angular position on the socket body and engaged with the first sleeve to serve as the first spring so as to urge the first sleeve toward the locking position, and the other end engaged with the second sleeve and adapted to serve as the second spring so as to urge the second sleeve toward the first angular position.

[0025] In one embodiment, the stopper receiving portion of the second sleeve is in the form of a slot extending from the second end toward the first end of the second sleeve. The stopper extends radially outwardly from the outer periphery of the socket. The stopper is engaged with the second end of the second sleeve when the second sleeve is located in the first angular position. The stopper is axially aligned with and inserted into the slot when the second sleeve is moved to the second angular position.

[0026] According to a further aspect of the present invention, there is provided a pipe coupling comprising a plug and a socket insertable into the plug for coupling engagement.

[0027] The socket includes a cylindrical socket body having a first through aperture extending radially therethrough, a locking element radially movable within the first through aperture and moved between a first radial position wherein the locking element is engaged with a locking recess on the plug so as to inhibit disconnection of the plug from the socket and a second radial position wherein the locking element is radially outwardly displaced from the first radial position and disengaged from the locking recess to allow disconnection of the plug from the socket, a sleeve disposed around the socket body and having a locking surface adapted to hold the locking element against radial outward movement and prevent movement of the locking element from the first radial position to the second radial position and an unlocking surface adapted to allow movement of the locking element from the first radial position to the second radial position, the sleeve being axially movable between a locking position wherein the locking surface is positioned radially outwardly of the locking element and an unlocking position wherein the unlocking surface is positioned radially outwardly of the locking element, and a spring for biasing the sleeve toward the locking position.

[0028] The plug includes a coupling end directed toward the socket, and a cylindrical surface extending from the coupling end in a direction away from the socket. The locking recess is defined on the cylindrical surface. The coupling end of the plug is slidably engaged with the locking element located in the first radial position to cause radial outward movement of the locking element when the plug is inserted into the socket.

[0029] The socket body includes a second through aperture located axially closer to the plug than the first through aperture and extending radially therethrough and a sleeve actuator disposed in the second through aperture and movable between a radially inward position wherein the sleeve actuator is engaged with the coupling end of the plug upon insertion of the plug into the socket and a radially outward position wherein the sleeve actuator is located radially outwardly from the radially inward position.

[0030] The sleeve has an inclined surface inclined radially outwardly from the locking surface toward the unlocking surface. The inclined surface is engaged with the sleeve actuator when the sleeve is located in the locking position. The coupling end of the plug is first engaged with the sleeve actuator upon insertion of the plug into the socket so that the sleeve actuator is radially outwardly moved to thereby cause axial movement of the sleeve against the bias of the spring. The coupling end of the sleeve then comes into engagement with the locking element during advancement of the plug. At this time, the inclined surface of the sleeve is moved to a radially outward position relative to the locking element. As the plug is further inserted, the coupling end of the plug radially outwardly urges the locking element against the inclined surface of the sleeve. An axial force is then exerted on the inclined surface of the sleeve through the locking element. This results in further axial movement of the sleeve.

[0031] According to a still further aspect of the present invention, there is provided a pipe coupling comprising a socket and a plug inserted into the socket for coupling engagement.

[0032] The socket includes a cylindrical socket body having a first through aperture extending radially therethrough, a locking element radially movable within the first through aperture and moved between a first radial position wherein the locking element is engaged with a locking recess on the plug so as to inhibit disconnection of the plug from the socket and a second radial position wherein the locking element is radially outwardly displaced from the first radial position and disengaged from the locking recess to allow disconnection of the plug from the socket, a first sleeve disposed around the socket body and having a locking surface adapted to hold the locking element against radial outward movement and prevent movement of the locking element from the first radial position to the second radial position and an unlocking surface adapted to allow movement of the locking element from the first radial position to the second radial position, the first sleeve being axially movable between a locking position wherein the locking surface is positioned radially outwardly of the locking element and an unlocking position wherein the unlocking surface is positioned radially outwardly of the locking element, and a first spring for biasing the first sleeve toward the locking position.

[0033] The plug includes a coupling end directed toward the socket, and a cylindrical surface extending from the coupling end in a direction away from the socket. The locking recess is defined on the cylindrical surface. The coupling end of the plug is slidably engaged with the locking element located in the first radial position to cause radial outward movement of the locking element when the plug is inserted into the socket.

[0034] The socket body includes a second through aperture located axially closer to the plug than the first through aperture and extending radially therethrough and a sleeve actuator disposed in the second through aperture and movable between a radially inward position wherein the sleeve actuator is engaged with the coupling end of the plug upon insertion of the plug into the socket and a radially outward position wherein the sleeve actuator is located radially outwardly from the radially inward position.

[0035] The first sleeve has an inclined surface inclined radially outwardly from the locking surface toward the unlocking surface. The inclined surface is engaged with the sleeve actuator when the first sleeve is located in the locking position. The coupling end of the plug is first engaged with the sleeve actuator upon insertion of the plug into the socket so that the sleeve actuator is radially outwardly moved to thereby cause axial movement of the first sleeve against the bias of the spring. The coupling end of the sleeve then comes into engagement with the locking element during advancement of the plug. At this time, the inclined surface of the sleeve is moved to a radially outward position relative to the locking element. As the plug is further inserted, the coupling end of the plug radially outwardly urges the locking element against the inclined surface of the sleeve. An axial force is then exerted on the inclined surface of the sleeve through the locking element. This results in further axial movement of the sleeve.

[0036] The pipe coupling further includes a second sleeve disposed around the first sleeve and movable between a first axial position and a second axial position, allowing axial movement of the first sleeve upon insertion of the plug when the second sleeve is placed in the first axial position, allowing the first sleeve to be moved from the locking position to the unlocking position against the bias of the first spring when the second

sleeve is moved from the first axial position to the second axial position, and rotatably moved on the socket between a first angular position and a second angular position, and a stopper arranged on the socket and engaged with the second sleeve to prevent axial movement of the second sleeve when the second sleeve is placed in the first angular position.

[0037] The second sleeve has a stopper receiving portion configured to prevent engagement of the stopper with the second sleeve and allow axial movement of the second sleeve when the sleeve is placed in the second angular position.

[0038] Preferably, the spring is a coil spring disposed about the socket body. The coil spring has one end located at a given angular position on the socket body and engaged with the first sleeve to urge the first sleeve toward the locking position, and the other end engaged with the second sleeve to urge the second sleeve toward the first angular position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] Fig. 1 is a side view, partially in section, of a pipe coupling according to a first embodiment, prior to insertion of a plug into a socket;

[0040] Fig. 2 is a side view, partially in section, of the pipe coupling, with a coupling end or tapered surface of the plug engaged with a plurality of sleeve actuators on insertion of the plug into the socket;

[0041] Fig. 3 is a side view, partially in section, of the pipe coupling, with the tapered surface of the plug engaged with a plurality of locking elements on further insertion of the plug into the socket;

[0042] Fig. 4 is a side view, partially in section, of the pipe coupling, with the sleeve actuators placed in contact with a cylindrical surface of the plug;

[0043] Fig. 5 is a side view, partially in section, of the pipe coupling, with the locking elements placed in contact with the cylindrical surface of the plug;

[0044] Fig. 6 is a side view, partially in section, of the pipe coupling, with a sleeve returned to its initial position so that the locking elements are held against a locking surface to prevent removal of the plug from the socket;

[0045] Fig. 7 is a plan view of a pipe coupling according to a second embodiment of the present invention, prior to insertion of a plug into a socket;

[0046] Fig. 8 is a side view, partially in section, of the pipe coupling shown in Fig. 7;

[0047] Fig. 9 is a side view, partially in section, of the pipe coupling, showing the manner in which a coupling end or tapered surface of the plug is engaged with a plurality of locking elements, and a plurality of sleeve actuators are radially outwardly displaced and engaged with a cylindrical surface of the plug;

[0048] Fig. 10 is a side view, partially in section, of the pipe coupling, with the locking elements placed in contact with the cylindrical surface of the plug;

[0049] Fig. 11 is a side view, partially in section, of the pipe coupling, showing the manner in which a first sleeve is returned to its initial position so as to apply a radial inward force to the locking elements; and

[0050] Fig. 12 is a side view, partially in section, of the pipe coupling, showing the manner in which a second sleeve is moved away from the plug and toward its second angular position to allow radial outward movement of the locking elements and the sleeve actuators.

LIST OF REFERENCE NUMERALS

10	pipe coupling
12	socket
14	plug
14-1	cylindrical surface
14-2	locking recess
14-3	tapered surface
14-4	side wall of locking recess
14-5	side wall of locking recess
18	socket body
18-1	first through apertures
18-2	second through apertures
20	locking elements
22	sleeve
22-1	locking surface
22-2	unlocking surface

22-3	inclined surface
24	spring
28	sleeve actuators
110	pipe coupling
112	socket
114	plug
118	socket body
118-2	large diameter shoulder portion
118-3	small diameter shoulder portion
118-4	groove
120	locking elements
122	first sleeve
130	second sleeve
130-1	first end
130-2	second end
130-3	slot
134	coil spring
140	first pin
142	second pin

PREFERRED EMBODIMENTS

[0051] The present invention will now be described with reference to the accompanying drawings.

[0052] Figs. 1 to 6 illustrate a pipe coupling made according to a first embodiment of the present invention.

[0053] As is conventional, a pipe coupling 10 includes a socket 12 and a mating plug 14 inserted into the socket 12 for coupling engagement.

[0054] The socket 12 includes a socket body 18 having a plurality of circumferentially spaced through apertures 18-1 (only one is shown) extending radially through the socket body 18, a plurality of locking elements radially movable within the respective through apertures 18-1, a sleeve 22 disposed around the socket body 18, and a spring 24 for urging the sleeve 22.

[0055] The plug 14 has a cylindrical surface 14-1 and an annular locking recess 14-2 formed on the cylindrical surface 14-1. The locking elements 20 are movable between a first radial position wherein the locking elements 20 are engaged with the locking recess to prevent disconnection of the plug 14 from the socket 12 (see Figs. 1, 2 and 6) and a second radial position wherein the locking elements 20 are disengaged from the locking recess to allow removal of the plug 14 from the socket 12 (see Fig. 4).

[0056] The sleeve 22 has a locking surface 22-1 and an unlocking surface 22-2. The locking surface 22-1 prevents the locking elements 20 from being radially outwardly moved from the first radial position (see Figs. 1, 2 and 6) toward the second radial position (see Fig. 4). The unlocking surface 22-2 allows the locking elements 20 to be radially outwardly moved into contact with the cylindrical surface 14-1. The sleeve 22 is axially movable between a locking position wherein the locking surface 22-1 is located radially outwardly of the locking elements 20 (see Figs. 1, 2 and 6) and an unlocking position wherein the unlocking surface 22-2 is located radially outwardly of the locking elements 20 (see Fig. 4). The spring 24 urges the sleeve 22 toward the locking position (see Fig. 6).

[0057] The plug 14 has a tapered surface 14-3 shaped to diverge 14-3 rearwardly and gradually from the front, coupling end of the plug 14. The cylindrical surface 14-1 is connected to the rear end of the tapered surface 14-3. The cylindrical surface 14-1 has a diameter greater than that of the coupling end of the plug 14 and substantially equal to the inner diameter of the socket body. The locking recess 14-2 is defined in the cylindrical surface 14-1. With the locking elements 20 in its first radial position, the inclined surface 14-3 is brought into engagement with the locking elements 20 when the plug 14 is inserted into the socket 12. Further insertion of the plug 14 causes radial outward movement of the locking elements 20.

[0058] The socket body 18 includes a plurality of second through apertures 18-2 (only one is shown) and a plurality of sleeve actuators 28 disposed in the respective second through apertures 18-2. The second through apertures 18-2 extend radially through the socket body 18 and are located axially outwardly from (or disposed closer to the coupling end of the plug 14 than) the first through apertures 18-1. The second through apertures 18-2 are arranged in a circumferentially spaced relationship.

Preferably, the second through apertures 18-2 and the first through apertures 18-1 are arranged in a circumferentially alternate fashion. The sleeve actuators 28 are movable between a radially inward position wherein the sleeve actuators 28 are engaged with the tapered surface 14-3 upon insertion of the plug 14 into the socket 12 (see Figs. 1 and 2) and a radially outward position wherein the sleeve actuators 28 are moved radially outwardly from the radially inward position and contacted with the cylindrical surface 14-1 of the plug 14. The sleeve 22 has an inclined surface 22-3 inclined radially outwardly from the locking surface 22-1 to the unlocking surface 22-2. When the plug 14 is inserted into the socket 12, the tapered surface 14-3 of the plug 14 is brought into engagement with the sleeve actuators 28. Further insertion of the plug 14 urges the sleeve actuators 28 to be radially outwardly moved into engagement with the inclined surface 22-3. As a result, an axial force is applied to the sleeve 22 through the inclined surface 22-3 so that the sleeve 22 is axially moved against the bias of the spring 24. Continued insertion of the plug 14 causes the tapered surface 14-3 to be engaged with the locking elements 20. While the locking elements 20 are radially outwardly moved, an axial force is applied to the sleeve 22 through the inclined surface 22-3 to cause further axial movement of the sleeve 22.

[0059] The locking recess 14-2 has a sufficient axial length. The locking recess 14-2 has axially opposite circumferential side walls 14-4, 14-5. Upon insertion of the plug 14, the sleeve actuators 28 and the locking elements 20 are received in the locking recess 14-2. The spring 24 then urges the sleeve 22 in a direction opposite the direction in which the plug 14 is inserted. With the locking elements 20 and the sleeve actuators 28 held in contact with the locking surface 22-1 of the sleeve 22, the locking elements 20 and the sleeve actuators are engaged with the side walls 14-4, 14-5 of the locking recess 14-2 (Fig. 6).

[0060] When the locking elements 20 are received in the locking recess 14-2 of the plug 14, the spring 24 causes the sleeve 22 to be returned to its locking position. With the sleeve 22 in its locking position, the locking surface 22-1 is held in engagement with the locking elements 20. This configuration prevents removal of the plug 14 from the socket 12 if a pulling force is exerted on the plug 14. To pull the plug 14 out of the socket 12, the user must axially move the sleeve 22 to its unlocking position against the

bias of the spring 24. With the sleeve in its unlocking position, the unlocking surface 22-2 is positioned radially outwardly of the locking elements 20.

[0061] Figs. 7 to 12 illustrate a pipe coupling 110 made according to a second embodiment of the present invention.

[0062] As shown, the pipe coupling 110 generally includes a socket 112 and a mating plug 114 insertable into the socket 112 for coupling engagement, as in the first embodiment. The socket 112 has a socket body 118 through which a plurality of first through apertures 118-1 are defined, a plurality of locking elements 120 radially movable in the first through apertures 118-1, and a first sleeve 122 extending around the socket body 118. The socket body 118, the locking elements 120 and the sleeve 122 correspond in structure and function to the socket 18, the locking elements 20 and the sleeve 22 used in the first embodiment, respectively. Similarly, the plug 114 corresponds to the plug 14 of the first embodiment.

[0063] In the second embodiment, the pipe coupling 110 further includes a second sleeve 130 disposed around the first sleeve 122. The second sleeve 130 is movable between a first axial position (see Figs. 7 to 11) and a second axial position (see Fig. 12). The second sleeve 130, when held in its first axial position, allows axial movement of the first sleeve 122 when the plug 114 is inserted into the socket 112. The second sleeve 130, when moved from its first to second axial position, allows the first sleeve 122 to be moved from its locking to unlocking position. The second sleeve 130 is also rotatably moved between a first angular position wherein no torque is exerted on the second sleeve 130, as shown in Fig. 7 and a second angular position wherein a slot 130-3, which will later be described, is moved to a position shown by imaginary line in Fig. 7.

[0064] A coil spring 134 is disposed about the socket body 118. The coil spring 134 has one end engaged with the first sleeve 122 to urge the first sleeve 122 toward its locking position. The other end of the coil spring 134 is engaged with the second sleeve 130 to urge the second sleeve 130 toward its first angular position.

[0065] The second sleeve 130 has a first end 130-1 located adjacent to the plug 114 and a second end 130-2 located remote from the plug 114. The slot 130-3 is defined in the second sleeve 130 and axially extends from the second end 130-2 toward the first

end 130-1. A radial pin 136 extends outwardly from the outer periphery of the socket body 118. With the second sleeve 130 held in its first angular position, the pin 136 is engaged with the second end 130-2 of the second sleeve 130 to prevent the second sleeve 130 from being moved from its first axial position (see Fig. 7) to its second axial position (see Fig. 12). When the second sleeve 130 is moved to its second angular position, the pin 136 is axially aligned with the slot 130-3 to thereby allow the second sleeve 130 to be moved to its second axial position.

[0066] In the illustrated embodiment, the socket body 118 includes a large diameter shoulder portion 118-2 and a small diameter shoulder portion 118-3. A groove 118-4 is defined in the small diameter shoulder portion 118-3 and has a given axial length. A first pin 140 is arranged in the groove 118-4, and a second pin 142 is arranged in the slot 130-3.

[0067] The coil spring 134 extends around the small diameter shoulder portion 118-3 and has opposite ends connected to the first and second pins, respectively. The coil spring 134 biases the first sleeve toward its locking position (to the right in the drawings) through the first pin 140. As the first sleeve 122 is engaged with the second sleeve 130, the second sleeve is also urged toward its first axial position. Also, the second pin 142 is urged against an end wall 118-5 of the small diameter shoulder portion 118-3. With this arrangement, the second sleeve 130 is held in its first axial and angular position, as shown in Fig. 7, when no force is applied thereto.